Name: ______________________________ Date: ______________

Polynomial Operations SOLUTION (version 158)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) = 8x^5 - 6x^3 + 9x^2 - 4x - 10$$

$$q(x) = 4x^5 + 10x^4 - 7x^3 + 6x - 9$$

Express the sum of $p(x) + q(x)$ in standard form.

Get "unsimplified" forms. Then find $p(x) + q(x)$ with addition/subtraction.

$$\begin{aligned} p(x) &= (8)x^5 + (0)x^4 + (-6)x^3 + (9)x^2 + (-4)x^1 + (-10)x^0 \\ q(x) &= (4)x^5 + (10)x^4 + (-7)x^3 + (0)x^2 + (6)x^1 + (-9)x^0 \\ p(x) + q(x) &= (12)x^5 + (10)x^4 + (-13)x^3 + (9)x^2 + (2)x^1 + (-19)x^0 \\ p(x) + q(x) &= 12x^5 + 10x^4 - 13x^3 + 9x^2 + 2x - 19 \end{aligned}$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) = 6x^2 + 3x - 7$$

$$b(x) = 5x + 9$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$6x^2$	$3x$	-7
$5x$	$30x^3$	$15x^2$	$-35x$
9	$54x^2$	$27x$	-63

$$a(x) \cdot b(x) = 30x^3 + 15x^2 + 54x^2 - 35x + 27x - 63$$

Combine like terms.

$$a(x) \cdot b(x) = 30x^3 + 69x^2 - 8x - 63$$

3. Express $(x + 1)^5$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$$

Polynomial Operations SOLUTION (version 158)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= 2x^3 - 7x^2 - 15x - 10 \\ g(x) &= x - 5 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x-5}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

$$\begin{array}{r|rrrr} & 2 & -7 & -15 & -10 \\ 5 & & 10 & 15 & 0 \\ \hline & 2 & 3 & 0 & -10 \end{array}$$

So,

$$\frac{f(x)}{g(x)} = 2x^2 + 3x + \frac{-10}{x-5}$$

In other words, $h(x) = 2x^2 + 3x$ and the remainder is $R = -10$.

5. Let polynomial $f(x)$ still be defined as $f(x) = 2x^3 - 7x^2 - 15x - 10$. Evaluate $f(5)$.

You could do this the hard way.

$$\begin{aligned} f(5) &= (2)\cdot(5)^3 \ + \ (-7)\cdot(5)^2 \ + \ (-15)\cdot(5) \ + \ (-10) \\ &= (2)\cdot(125) \ + \ (-7)\cdot(25) \ + \ (-15)\cdot(5) \ + \ (-10) \\ &= (250) \ + \ (-175) \ + \ (-75) \ + \ (-10) \\ &= -10 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(5)$ equals the remainder when $f(x)$ is divided by $x - 5$. Thus, $f(5) = -10$.